

Science, Technology and Requirements - Forum

Maneuver Support Center of Excellence MSCoE

Fort Leonard Wood, MO

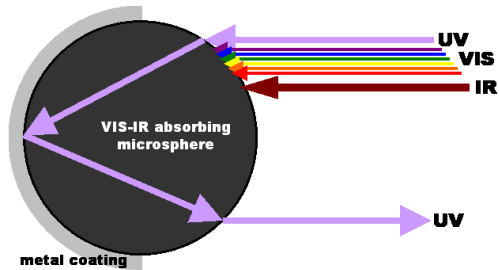
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- Established in 1985 to manufacture niche specialty glass/ceramic products.
- Customer base is primarily Fortune 500 Pharmaceutical and Healthcare companies (2000+ customers in 50 countries).
- Products include glass powders, microspheres, fibers and ribbons.
- 40 Employees with annual payroll >\$2.2M
- SBIR/STTR Funding ~ 5-10% of total revenue
- 19 Phase I Awards
- 4 Phase II Awards
- Commercialization Index 10 for 21 projects (48%)
- 4 Army projects since 2008 (~\$1.6M total)
- 2008 Infrared Retroreflective Visible Absorbing and Electrostatically Adhesive Taggants
- 2008 Removal of CBRN Materials from Soil & Water using Nanosize Hydroxyapatite
- 2009 Ribbon Composite for Optically Transparent Armor Windows
- 2010 UV Retroreflector Covert Taggants
- 2013 Proposed Warfighter Bandaging System

W³ (What's Worked Well)

- Project Topic Solicitation – well defined and easy to find if you know where to look.
HINT: Call the program manager and talk about what they want...not what you interpret.
- Proposal / White Paper Format – well defined. No problems.
HINT: Find someone experienced in DOD proposal writing for your first proposal.
- Feedback or Debrief on Proposal – Usually prompt and to the point.
Recommendation – Propose a method for the reviewer/proposer to have an exchange of ideas or to address questions.
- Contract Administration – No Problems. Many times the contact person changes and the contractor is not notified.
- Project Reports – Very well defined.
- Payment – Expectations are clearly defined in the contract. Can require multiple systems over the course of the project.



Development and fabrication of lead-free glass retroreflector beads with high optical transmission in the UV. These beads can be used as covert taggants on uniforms, equipment, or vehicles that can be tracked from long distances.

Some current commercial glass microspheres are designed to retroreflect light in the UV and IR regions while blocking visible light. The UV spectral region presents opportunities to gather information covertly.

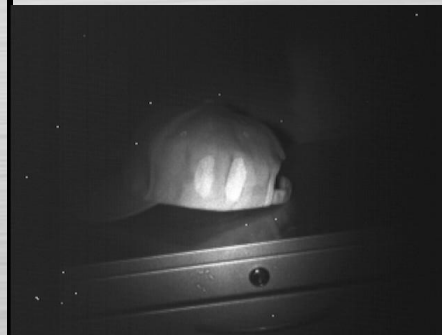
APPLICATIONS - TRANSITION

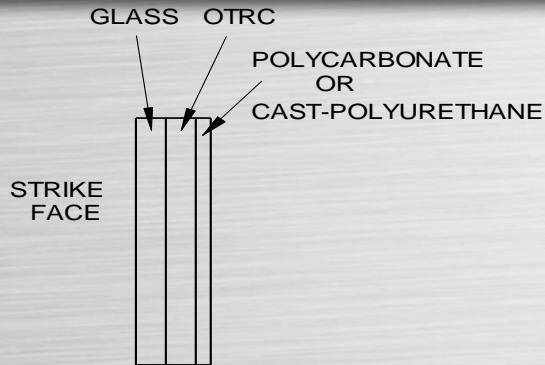
- UV taggants can be used to gather information covertly compared to the infrared regions which have a variety of available surveillance sources and detectors.
- Need: All military branches for long-distance detection, and for CBRN (chemical, biology, radiation, and nuclear) detection.
- Commercial applications: While the UV-retroreflectors are intended in principle for military applications; the glass technology can be used to develop retroreflectors for improved marking in highways, textiles, and signs.

OBJECTIVES - METHODS

- Statistical experimental design was used to improve and/or modify glass compositions and search the potential fabrication of GRIN (Gradient Refractive Index) beads to optimize retroreflection.
- Lead-free borate and phosphate glass retroreflector microspheres (50 to 200 μm diameter) tuned for ultra-violet (UV) wavelength were fabricated.
- Phosphate glasses were also developed with relative high refractive index, high UV-transmission, and high chemical durability. The chemical composition of both, borate and phosphate glasses, was tailored for maximum UV-transmission, maximum refractive index for retroreflection, and low cost manufacturing.

Results



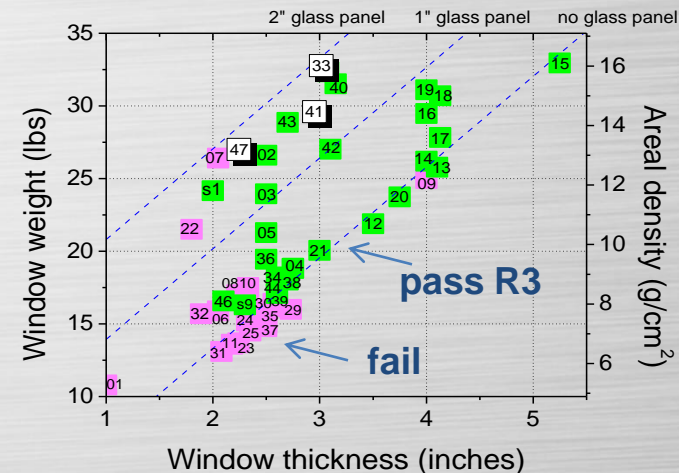


Development and fabrication of high-strength optically transparent glass ribbon composites (OTRC) as components of laminated armor windows

Commercial soda-lime glass windows are 38 mm (1.5") thick with an areal density of 8.4 g/cm² (17.2 lbs/ft²) for STANAG Level 1

OBJECTIVES - METHODS

Laminated 12"x12" windows were tested for ballistic resistance per ASTM F1233-08 R3 (M80 ball), R4 (M2AP), and per MIL-STD-662F to determine V_{50}



APPLICATIONS - TRANSITION

- OTRC components can be used as backings in armor windows, as they have 5 to 10 times the flexural strength of transparent polymers (polycarbonate, acrylics)
- Other applications include high impact resistance windshields, structural airplane passenger-windows, and structural and hurricane-resistant windows.
- A validated finite element computer model provides capability for calculating impact damage of windshield panels under bird strike up to 500 km/h – but below that of ballistic projectiles

DELIVERABLES

- Metrics and Deliverables: 12"x12"x2.5" laminated armor window that contains an OTRC and passes R3 test



Prototype armor window incorporating an OTRC panel and passing the R3 test, similar to commercial armor windows: 2.1" thick and 16.6 lbs/ft² (8.1 g/cm²). However, the use of OTRC components allows multi-hit capability and partial viewing through the windows after ballistic testing.

DermaFuse – Bioactive Glass Tissue Scaffolding System

Properties:

- Bioactive fiber tissue scaffolding (bonds to both hard and soft tissue)
- Hemostatic and Bioresorbable
- Antimicrobial
- Does not require debridement



In Vitro coagulation assay of bioactive glass nanofibers (*DermaFuse*)

	Reaction time (minutes)	Clotting time (minutes)	Coagulation index	% lysis at 30 min
Whole blood	9.0	2.3	-3.2	2.1
DermaFuse	1.2	1.3	4.4	1.5
Combat Gauze	3.5	1.4	2.7	3.0
Kerlix	8.1	2.5	-2.1	3.9

